WHAT IS CLAIMED IS:

1. A method for non-linearity compensating interferometer position data, the method comprising:

receiving a plurality of groups of digital position values;

digitally processing a first group of the digital position values to generate a plurality of data values;

digitally processing the plurality of data values to generate at least one quasi-static non-linearity parameter; and

compensating a second group of the digital position values based on the at least one quasi-static non-linearity parameter.

2. The method of claim 1, wherein the first group includes only measured digital position values.

3. The method of claim 1, wherein the second group includes only measured digital position values.

4. The method of claim 1, wherein the second group includes measured digital position values and extrapolated digital position values.

5. The method of claim 1, wherein each group of digital position values includes 320 position-data words.

6. The method of claim 5, wherein the first group is processed in blocks of 32 words each.

7. The method of claim 6, wherein each position-data word is 32 bits.

8. The method of claim 1, wherein the at least one quasi-static non-linearity parameter is generated based on a block regression technique.

9. The method of claim 1, wherein the at least one non-linearity parameter includes a non-linearity magnitude parameter and a non-linearity phase parameter.

10. The method of claim 1, wherein the temporal frequency of the non-linearity being compensated is the Doppler frequency.

11. A compensation system for compensating interferometer position data, the system comprising:

an input for receiving a plurality of groups of digital position values, each digital position value including a whole number portion and a fractional number portion;

a digital position-data processor for digitally processing a first group of the digital position values and generating a plurality of data values;

a digital data value processor for processing the plurality of data values and generating at least one non-linearity parameter; and

a digital compensator for compensating a second group of the digital position values based on the at least one non-linearity parameter.

12. The compensation system of claim 11, wherein the digital position-data processor comprises:

a cosine look-up table coupled to the input for providing cosine values corresponding to the fractional portion of received digital position values;

a sine look-up table coupled to the input for providing sine values corresponding to the fractional portion of received digital position values;

a first plurality of arithmetic logic units (ALUs) for arithmetically processing the cosine values and the sine values, each ALU in the first plurality configured to output one of the plurality of data values based on the arithmetic processing; and

a second plurality of ALUs coupled to the input for arithmetically processing the digital position values in the first group, each ALU in the second

plurality configured to output one of the plurality of data values based on the arithmetic processing.

13. The compensation system of claim 12, wherein the digital position-data processor further comprises:

a plurality of registers coupled to the ALUs in the first and the second pluralities for storing the plurality of data values.

14. The compensation system of claim 13, wherein the digital position-data processor further comprises:

a counter coupled to the plurality of registers, the counter configured to cause the registers to store the plurality of data values at the end of each group of digital position values.

15. The compensation system of claim 14, wherein the counter is configured to generate signals for controlling operation of the first and the second plurality of ALUs.

16. The compensation system of claim 12, and further comprising:

a digital sequence generator for generating a plurality of digital sequences; and

a third plurality of ALUs coupled to the digital sequence generator for arithmetically processing the digital sequences, each ALU in the third plurality configured to output one of the plurality of data values based on the arithmetic processing.

17. The compensation system of claim 16, wherein the plurality of digital sequences include a constant sequence, a linearly increasing sequence with zero mean, and a quadratic sequence with zero mean, and wherein summation of one of the sequences results in a power-of-2 value, and summation of each of the remaining sequences results in a zero value.

18. The compensation system of claim 11, wherein each group of digital position values includes 320 position-data words.

19. The compensation system of claim 17, wherein each position-data word is 32 bits.

20. The compensation system of claim 11, wherein the at least one non-linearity parameter includes a non-linearity magnitude parameter and a non-linearity phase parameter.

21. The compensation system of claim 11, wherein the temporal frequency of the non-linearity being compensated is the Doppler frequency.

22. A displacement measuring interferometer system comprising:

a light source for generating at least one light beam;

an interferometer for generating an optical measurement signal based on the at least one light beam;

a receiver for receiving the optical measurement signal and an optical reference signal, the receiver configured to generate an analog measurement signal based on the optical measurement signal and configured to generate an analog reference signal based on the optical reference signal;

a controller for generating a plurality of groups of digital position values based on the analog measurement signal and the analog reference signal; and

at least one digital signal processor coupled to the controller for digitally processing each group of the digital position values and generating a plurality of data values for each processed group, the at least one digital signal processor configured to digitally process the plurality of data values for each processed group to generate at least one non-linearity parameter for each processed group, the at least one digital signal processor configured to compensate digital position values based on the generated non-linearity parameters.

23. The interferometer system of claim 22, wherein each group of digital position values includes 320 position-data words.

24. The interferometer system of claim 22, wherein the at least one non-linearity parameter includes a non-linearity magnitude parameter and a non-linearity phase parameter.

25. The interferometer system of claim 22, wherein the temporal frequency of the non-linearity being compensated is the Doppler frequency.